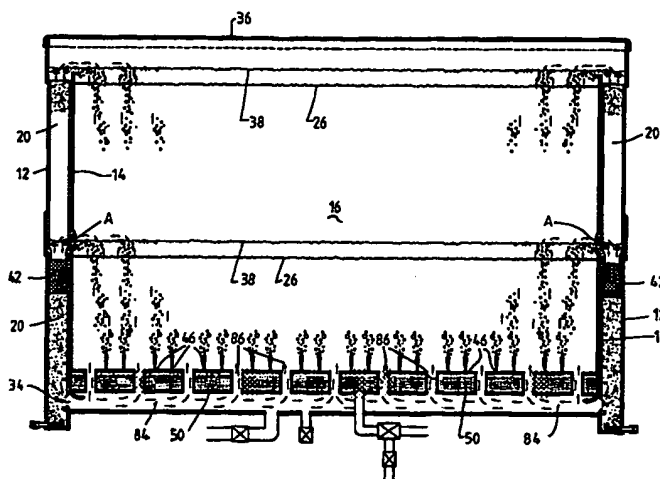


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(54) Title: WASHING APPARATUS



## (57) Abstract

Washing apparatus (10) includes a washing vessel (12) divided by a wall (14) into a washing chamber (16) in which articles (18) to be washed are deposited, and a catchment chamber (20) for catching dirt and other foreign matter washed from the articles (18). The washed chamber (16) and catchment chamber (20) are in fluid communication to allow a recirculating flow of cleaning liquid from the washing chamber (16) through the catchment chamber (20) and back to the washing chamber (16). Air inlet (24) is provided for directing air into the washing chamber (16) from a location below the articles (18). When in use, the vessel (12) is filled with water to a predetermined level (26) and air directed through the air inlet (24) into the washing chamber (16). The air as it enters the chamber (16) forms bubbles which flow across the articles (18) and turbulate the water within the chamber (16). This removes dirt and other foreign matter from the articles (18). Water entering the chamber (16) also displaces water within the chamber (16) and acts to recreate a recirculating flow (22) of water from the washing chamber (16) through the catchment chamber (20) and back to the washing chamber (16). Air recirculating flow (22) carries with it dirt and other foreign matter that was held in the catchment chamber (20) and thus separated from the recirculating flow (22).

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Title**WASHING APPARATUS**Field of the Invention

5 The present invention relates to a washing apparatus, and in particular, but not exclusively, to a washing apparatus for washing dishes (ie cutlery, crockery, pot and pans etc); clothes; or machine parts.

Background of the Invention

10 The present invention was inspired by the inherent inefficiency of commercially available domestic automatic dishwashers. In general, a dishwasher is able to wash dishes only because it maintains the dishes in contact with very hot water and corrosive chemicals for an extended period of time. Further, notwithstanding claims by their manufacturers, many dishwashers are unable to effectively clean dishes which have baked on or dried foodstuffs. Many manufacturers also recommend against placing wooden handled items, glued items, fine china/crystal; or heat  
15 sensitive items in their dishwashers.

Summary of the Invention

It is an object of the present invention to provide an alternate type of washing apparatus in which cleaning time may be reduced and washing efficiency improved. As explained in greater detail below, although the domestic dishwasher formed the  
20 motivation for the present invention, the washing apparatus can be used to wash many different types of articles.

According to the present invention there is provided a washing apparatus including:

25 a washing vessel divided into a washing chamber in which articles to be washed are deposited and a catchment chamber for catching dirt or other foreign matter washed from the articles;

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the washing chamber and catchment chamber in fluid communication to allow a recirculating flow of cleaning liquid from the washing chamber through the catchment chamber and back to the washing chamber; and,

a first air inlet for directing air into the washing chamber from a location  
5 below any article deposited in the washing chamber for cleaning;

whereby, in use, the washing vessel is filled with a cleaning liquid to a predetermined level and air is directed through the first air inlet into the washing chamber, the air forming air bubbles which flow across the articles and turbulate the cleaning fluid within the washing chamber thereby washing  
10 dirt or other foreign matter from the articles, the air also acting to create a recirculating flow of cleaning liquid from the washing chamber to the catchment chamber and back to the washing chamber, the recirculating flow carrying dirt or other foreign particles washed from the articles into the catchment chamber for separation from the recirculating flow.

15 Preferably the apparatus includes a wall over which cleaning liquid must flow to enter the catchment chamber from the washing chamber, forming an upper flow path for the cleaning liquid.

In a first embodiment, the wall divides the washing vessel into said washing chamber and catchment chamber, the wall configured to provide a lower flow path through  
20 which cleaning fluid can flow from the catchment chamber to the washing chamber.

In a second embodiment, the wall is shaped to form a gutter about an inside wall of the washing vessel and the catchment chamber includes one or more pipes leading from the gutter back to the washing chamber thereby providing a lower flow path through which cleaning fluid can flow from the catchment chamber to the washing  
25 chamber.

Preferably the apparatus includes a valve for selectively opening and closing the lower flow path, whereby when the one way valve is closed, the catchment chamber can be drained of cleaning liquid separately from the washing chamber.

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Preferably the valve is a one way valve to prevent a back flow of cleaning liquid from the washing chamber to the catchment chamber.

5 Preferably in the first embodiment the one way valve comprises a gate or flap which is hung or hinged to the wall so as to close when liquid pressure in the washing chamber exceeds liquid pressure in the catchment chamber.

Preferably the first air inlet includes a plate provided with a plurality of through holes, the plate overlying and spaced above a bottom wall of the washing chamber to form, with the bottom wall, a manifold chamber into which air is delivered for bubbling through the washing chamber.

10 Preferably the plate is inclined to allow drainage of cleaning liquid when the washing vessel or washing chamber is drained.

15 Preferably in the first embodiment the catchment chamber returns cleaning liquid to the washing chamber at a location above the plate. Preferably the bottom of the catchment chamber is sunk to a position below the lower flow path to provide a relatively static pool of cleaning liquid in which the dirt and foreign matter can settle.

Alternately in either the first or second embodiments the lower flow path returns cleaning fluid to a location below the plate.

20 Preferably the manifold chamber is adapted to receive a cleaning liquid supply line to allow the filling of the vessel with cleaning liquid via the manifold chamber and the holes in the plate.

Preferably each of the washing chamber and catchment chamber is provided with a separate drain to allow independent draining of the washing chamber and catchment chamber.

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Preferably air and cleaning liquid can be simultaneously delivered to the manifold chamber to provide a mist or spray of cleaning liquid for rinsing articles deposited in the washing chamber.

5 Preferably the washing apparatus further includes a second air inlet for directing air onto articles held within the washing chamber when the washing chamber is drained of cleaning liquid to facilitate drying of the articles.

Preferably the catchment chamber is provided with a removable filter to assist in separating dirt and foreign material from the recirculating liquid.

10 Preferably the wall is slidably retainable at different locations within the washing vessel to allow variation in the position of the wall or removal of the wall.

#### Brief Description of the Drawings

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

- Figure 1 is a side view of a first embodiment of the washing apparatus;
- 15 Figure 2 is a top view of the washing apparatus shown in Figure 1;
- Figure 3 is a side view of a second embodiment of the washing apparatus during a draining cycle;
- Figure 4 is a side view of the washing apparatus shown in Figure 3 during a washing cycle;
- 20 Figure 5 is an enlarged partial side view of a portion of a dividing wall used in the washing apparatus shown in Figures 3 and 4;

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Figure 6 shows a side view of a third embodiment of the washing apparatus;

Figure 7 is a partial view of a fourth embodiment of the washing apparatus;

Figure 8 is a schematic representation of a fifth embodiment of the washing apparatus;

5 Figure 9 is a section view of a part of the washing apparatus shown in Figure 8;

Figure 10 is a top view of a sixth embodiment of the present invention;

Figure 11 is a sectional view from the side of the washing apparatus shown in Figure 10;

10 Figure 12 is an enlarged partial view of the washing apparatus shown in Figures 10 and 11.

#### Detailed Description of the Preferred Embodiments

Referring to the accompanying drawings in particular Figures 1 and 2, the washing apparatus 10 includes a washing vessel 12 which is divided by a wall 14 into a washing chamber 16 in which articles 18 to be washed (in this embodiment the articles being dishes) are deposited, and a catchment chamber 20 for catching dirt and other foreign matter washed from the dishes 18. The wall 14 is configured to allow a recirculating flow of cleaning liquid, such as water, between the washing chamber 16 and the catchment chamber 20 as indicated by arrows 22. A first air inlet 24 is provided for directing air into the washing chamber 16 from a location below the dishes 18 deposited in the washing chamber 16. When in use, the vessel 12 is filled with water to a predetermined level 26 and air is directed through the air inlet 24 into the washing chamber 16. The air as it enters the chamber 16 forms bubbles which will flow across the dishes 18 and turbulate the water within the

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chamber 16. This removes dirt or other foreign matter from the dishes 18. The air which is bubbled through the chamber 16 also acts to create the recirculating flow 22 of water from the washing chamber 16 through the catchment chamber 20 and back to the washing chamber 16. The recirculating flow 22 carries with it dirt or other foreign matter washed from the dishes 18. This is largely held in the catchment chamber 20 and thus separated from the recirculating flow 22.

It is believed that the dirt and other foreign matter is largely held within the catchment chamber 20 because of the non turbulent flow of water through that chamber. The non turbulent flow exists because the air inlet 24 only supplies air to the washing chamber 16 and not to the catchment chamber 20.

One possible embodiment of the wall 14 is shown in Figure 1A. Here, the wall 14 is in the form of a rectangular plate 28 having an upper edge 30 and lower edge 32. A row of holes 34 is formed along and slightly above the lower edge 32. The plate 28 is of a height smaller than the depth of the vessel 12. Accordingly, as most clearly seen in Figure 1, a gap is formed between the upper edge 30 of plate 28 and a lid 36 of the vessel 12. The predetermined level 26 of water within the vessel 12 is lower than the height of the plate 28. The gap between the edge 30 and lid 36 provides an upper flow path through which water can flow from the washing chamber 16 to the catchment chamber 20. The holes 34 in plate 28 form a lower flow path through which water in the catchment chamber 20 can flow back into the washing chamber 16. The air which is supplied via the air inlet 24 and is bubbled through the chamber 16, displaces some of the water within the chamber 16 giving the effect of lifting the level of water to a level 38 which is above the edge 30 of plate 28. Accordingly water from the washing chamber 16 flows through the upper flow path over the wall 14 into the catchment chamber 20. This in turn forces water to flow from the catchment chamber 20 through the holes 34 back into the washing chamber 16 thus creating the recirculating flow 22. The water is also drawn from the catchment chamber 20 by the lifting action of the air in the washing chamber 16. After the air has bubbled from the water held within the vessel 12, it escapes via a vent 40 to the atmosphere. The vent 40 is provided on a side wall of the chamber 12



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at a level above the air lifted level 38 of water.

It has been found that the recirculating flow 22 has the effect of carrying dirt or other foreign material washed from the plates 18 into the catchment area 20. Further, it has been discovered that the dirt or other foreign material largely remains entrapped within the catchment area 20 notwithstanding the recirculatory nature of the flow of water. This in effect separates the dirt or foreign material from the recirculating water. This effect is achieved even without the provision of any filter within the chamber 20. Nevertheless, this feature can be somewhat enhanced by the provision of a removal filter 42 disposed within the catchment chamber 20. It is thought that the lack of turbulence in the water within chamber 20 in comparison with the turbulence in chamber 16 largely provides the separation effect described above. Moreover, by having the lower return path (ie holes 34) above the bottom of the catchment chamber 20 a relatively static pool of water is formed in which the dirt etc can settle. A similar effect and/or an enhancement of this effect can be achieved by sinking or recessing the bottom wall of the catchment chamber.

The air inlet 24 includes a plate 44 which is provided with a plurality of through holes 46. The plate 44 is located within the washing chamber 16 and overlies and is spaced above a bottom wall 48 of the washing chamber 16. The plate 44 together with the bottom wall 48 form a manifold chamber 50 into which can be provided both air and water. To this end, an air supply conduit 52 is plumbed into the manifold chamber 50 via spaced apart risers 54 and 56 feeding from the conduit 52. The conduit 54 is provided with a further riser 58 through which air can be diverted from the conduit 52 directly into the washing chamber 16. A valve 60 is provided in conduit 52 upstream of the riser 58. A further valve 62 is provided in riser 58 downstream of the valve 60. A drain 64 is formed in the conduit 52 opposite the riser 56. The drain 64 allows drainage for water which may otherwise enter the conduit 52. A hose 66 provided with a click on connector 68 is used to couple the conduit 52 to a air supply such as a fan or blower (not shown). A water conduit 70 is also plumbed into the manifold chamber 50 for supplying water to the vessel 12. The water conduit 70 is adapted to receive a hose which in turn can be coupled to a

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mains water supply. Two such conduits 70 may be provided to allow connection to separate hot and cold water supplies or a water supply and a detergent or additives supply. A drain 72 is provided at the bottom of the catchment chamber 20. A separate drain 74 is also provided at the bottom of the manifold chamber 50.

5 Conveniently, the drains 64, 72 and 74 can be operated by respective solenoids to allow automation of the opening and closing of the drains.

A typical operational cycle of the apparatus 10 will now be described. With the vessel 12 empty, dishes 18 are placed in the washing chamber 16 typically on a rack 75 (which does not perform part of this invention). Water is supplied into the

10 washing chamber 12 through the water conduit 70 which delivers water initially to the manifold chamber 50. From there, the water simply passes through the holes 46 in the plate 44 to fill the chamber 16. Water is then able to flow into the catchment chamber 20 via the holes 34 in the wall 14. The water is filled to a predetermined level 26 which, in this instance, is near but below the upper edge 30 of wall 14. A

15 washing detergent or agent may be added to the water if desired. The supply of water through conduit 70 is then turned off. The valve 62 is closed and air then delivered via hose 66, conduit 52 and risers 54 and 56 into the manifold chamber 50. The air then bubbles through the holes 46 in plate 44 so as to rise through the water in the chamber 16. The air bubbles flow across the surface of the plates 18 and

20 turbulate the water. In addition, the air displaces water within the chamber 16 causing the mean water level to rise to the level 38 which is above the upper edge 30 of wall 14. Accordingly, water flows over the edge 30 from the washing chamber 16 to the catchment chamber 20 to commence the recirculating flow 22 of the water. It will be appreciated that no air is bubbled through the catchment chamber 20.

25 Accordingly, the water within the chamber 20 has a steady, rather than turbulent, flow.

It has been discovered that the recirculating flow 22 carries with it dirt or other foreign material thereby directing them into the catchment chamber 20. Because of the non turbulent and steady flow of water in the chamber 20, the last proportion of

30 the dirt and foreign matter seems to settle within the chamber 20 rather than flow

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back into the washing chamber 20. In this way, the chamber 20 in effect acts to separate the dirt and foreign material from the recirculating flow. The separation can be assisted by the inclusion of the filter basket 42.

5 Initial tests have indicated that an embodiment of the apparatus 10 can provide a superior washing effect in approximately 10 minutes to that of a typical commercially available domestic electric dishwasher which may have washing cycles up to one hour in duration.

10 Once washing is complete, the drains 72 and 74 can be opened (which may then funnel into a common drain pipe, (not shown) to empty the vessel 12. If it is desired to provide a rinse to the dishes 18, a low volume supply of water can be delivered through conduit 70 simultaneously with the delivery of air through conduit 52. The air and water mix in the manifold chamber 50 and pass as a fine mist through the holes 46 in plate 44. If desired, a rinsing aid may be added to the water during this stage as it flows through the conduit 70. During the rinsing phase, the drains 72 and 15 74 would normally be left open. Once rinsing has been completed the supply of water to conduit 70 is turned off. The dishes 18 can then be dried by delivering air through conduit 52 into the manifold chamber 50 which then passes across the dishes 18. Alternately, or in addition, the valve 62 can be opened to allow air to be blown in, at least initially, a horizontal direction into the chamber 12.

20 In a second embodiment shown in Figures 3-5, in which the same reference numbers are used to denote the same features as described in relation to the first embodiment, the holes 34 of the first embodiment are replaced with an elongate slot 34'. A one way valve 76 is provided on the wall 14 to prevent a back flow of liquid from the washing chamber 16 to the chamber 20 through the slot 34'. The one way valve 76 25 is in the form of a gate or flap 78 which is hung or hinged onto the wall 14. The purpose of the valve 76 is to isolate the chambers 16 and 20 so that they can be drained separately. In particular, it may be desired to drain the catchment chamber 20 after completing a washing cycle but to maintain the water in chamber 16 for reuse. The valve 76 is configured to close and more particularly seal the slot 34'

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when no air is bubbled into the chamber 16. To this end, the gate 78 may be biased by a spring or by the provision of a weight 80 disposed near its lowest edge. This will allow for example, the washing of say relatively clean dishes first (eg cups and glasses) followed then by washing of more heavily soiled articles such as pots and pans and dishes while minimising water use. Due to the ability of the apparatus 10 to separate the dirt and other matter from the articles being washed, the water in chamber 16 after one wash load remains relatively clean.

In this embodiment, it may be advantageous to provide one or more struts 82 between the wall 14 on the side of chamber 20 and a side wall of the vessel 12 to counter the pressure of the water within the chamber 16 when the chamber 20 is empty. Further, to allow initial filling of the chamber 20 the water supply conduit 20 can be provided with a secondary branch which feeds directly into the chamber 20.

In yet a further variation the valve 76 (or another valve having the same purpose) can be operated electrically, say by a solenoid so as to close on demand to allow the separate draining of the chamber 20 from the chamber 16. This avoids the need of further plumbing to ensure initial filling of the chamber 20.

In yet a further variation shown in Figure 6, two washing apparatuses 10A and 10B in accordance with embodiments of this invention may be stacked on top of each other. Each apparatus 10A and 10B is in a form substantially the same as that shown in Figures 1 and 2. In this arrangement, if only a small wash load is required, then only apparatus 10A is loaded with the articles to be washed and then operated in the manner described above. The water in the apparatus 10A can be drained by dumping into the lower apparatus 10B and then utilising the drains of apparatus 10B.

If a large wash is required, apparatus 10B is first loaded with articles by lifting apparatus 10A therefrom. Thereafter, the apparatus 10A is fitted on the top of apparatus 10B thereby acting as a lid for apparatus 10B. Articles are then loaded into the washing chamber 16 of apparatus 10A. Apparatus 10A is operated in the normal manner described in relation to the first embodiment to clean the dishes held

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therein. Once the cleaning has finished, the water in the chamber 20 of apparatus 10A is dumped into the chamber 20 of apparatus 10B and then drained completely from the system. This requires the use of the valve 76 or similar mechanism to allow the separate dumping of the water in chambers 16 and 20 of apparatus 10A.

5    Thereafter, the water held in chamber 16 of apparatus 10A is dumped into underlying apparatus 10B typically by use of the drain 72 of the chamber 20 of the upper apparatus 10A. As explained above, the water being dumped from the washing chamber 16 of apparatus 10A into apparatus 10B will be relatively clean. The water level in apparatus 10B is then topped up so as to reach the predetermined level 26  
10   following which apparatus 10B operate in the normal manner. While apparatus 10B is being operated in this manner apparatus 10A can be separately operated to rinse and dry the articles held therein.

In this way, the amount of water used is minimised. The minimisation can be further enhanced by dumping the water used in rinsing the articles held in apparatus 10A  
15   into the apparatus 10B prior to commencing the washing cycle of apparatus 10B.

In the embodiments shown in Figures 1, 3, 4 and 6 the water from the catchment chamber 20 returns into the washing chamber 16 at a location above the air inlet 24/plate 44. However, in the embodiment shown in Figure 7, a water return chamber 84 is provided beneath the manifold chamber 50 and the water flowing in its lower  
20   path through the catchment chamber 20 is directed via valve 76 into the water return chamber 84. The plate 44 is provided with a plurality of apertures 86 through which the water in the water return chamber 84 can flow back into the washing chamber 16. Thus, in the embodiment shown in Figure 7, the water is returned to the washing chamber 16 from a location below the plate 44. As air bubbles through the plate 44,  
25   it is assists in drawing the water back into the washing chamber 20 therefore further assisting in the recirculation of the water through the washing chamber 16, catchment chamber 20 and back into the washing chamber 16. This also allows the water to be return over a much greater area and at locations distance the valve 76. This assists in speeding the cleaning action.

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A further embodiment shown in Figures 8 and 9 where the catchment chambers 20 are formed by pipes 83 that extend from an upper portion of the washing chamber 16 and then turn the washing liquid to a water return chamber 84 underlying the manifold chamber 50. Also in this embodiment, the wall 14 now forms a gutter about the inside surface of the washing chamber 16, the gutter leading to the upper end of the pipes constituting the catchment chambers 20. The lower end of the pipes 83 extend below the valves 76 to produce a relatively static pool in which dirt and other matter can settle prior to discharge through drain 72. Thus, in this embodiment, water can flow over the upper edge 30 of the wall 14 into the gutter from anywhere around the washing chamber 14. This further enhances the speed of cleaning as dirty water can be drawn into the catchment chambers 20 from all about the periphery of the washing chamber 14.

In the embodiment shown in Figures 10-12, an annular catchment chamber 20 is formed by a circular wall 14 of a diameter less than that of the washing vessel 12. This embodiment is particularly well suited to allow easy changing of the volume of the washing chamber 16 by forming the wall 14 in demountable sections. For example, with reference to Figure 11, the wall 14 can be made in two circular parts that mate together about a circumferential line containing points A-A. In this form, with the top section of the wall 14 removed, a small wash requiring less water can be performed.

In yet a further variation on the embodiment shown in Figure 1, the washing chamber 16 can be provided with a movable partition so as to decreased its total volume. This allows the operation of the apparatus 10 for cleaning relatively small loads with commensurate lower volumes of water. The partition in this instance ideally would extend to the lid 36.

Now that embodiment of this invention have been described in detail it will be apparent to those skilled in the relevant arts and numerous modifications and variations may be made without departing from the basic inventive concepts. Most notably, the embodiments of the apparatus 10 can be used for cleaning essentially

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any item which is normally cleaned by use of water and/or detergents/solvents. For example, the apparatus can be used for washing clothes, or machine parts. Further, the apparatus 10 can be incorporated into a typical domestic stainless steel sink so that, when used for cleaning dishes, dishes from say a dinner table can simply be

5 loaded into the sink and then operated in the manner indicated above. In this form, a slide out lid or a separate lid will need to be applied across the top of the sink. Additionally, further and/or different air and or water manifolds can be provided in different positions to provide enhanced rinsing, filling or drying effects. All such modifications and variations are deemed to be within the scope of the present

10 invention the nature of which is to be determined from the foregoing description and the appended claims.

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## CLAIMS

1. A washing apparatus including:  
a washing vessel divided into a washing chamber in which articles to be washed are deposited and a catchment chamber for catching dirt or other foreign matter washed from the articles;  
5 the washing chamber and catchment chamber in fluid communication to allow a recirculating flow of cleaning liquid from the washing chamber through the catchment chamber and back to the washing chamber; and,  
a first air inlet for directing air into the washing chamber from a location  
10 below any article deposited in the washing chamber for cleaning;  
whereby, in use, the washing vessel is filled with a cleaning liquid to a predetermined level and air is directed through the first air inlet into the washing chamber, the air forming air bubbles which flow across the articles and turbulate the cleaning fluid within the washing chamber thereby washing  
15 dirt or other foreign matter from the articles, the air also acting to create a recirculating flow of cleaning liquid from the washing chamber to the catchment chamber and back to the washing chamber, the recirculating flow carrying dirt or other foreign particles washed from the articles into the catchment chamber for separation from the recirculating flow.
- 20 2. A washing apparatus according to claim 1 further including a wall over which cleaning liquid must flow to enter the catchment chamber from the washing chamber, forming an upper flow path for the cleaning liquid.
3. A washing apparatus according to claim 2 wherein the wall divides the washing vessel into said washing chamber and catchment chamber, the wall  
25 configured to provide a lower flow path through which cleaning fluid can flow from the catchment chamber to the washing chamber.
4. A washing apparatus according to claim 2 wherein the wall is shaped to form a gutter about an inside wall of the washing vessel and the catchment



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chamber includes one or more pipes leading from the gutter back to the washing chamber thereby providing a lower flow path through which cleaning fluid can flow from the catchment chamber to the washing chamber.

5. A washing apparatus according to claim 1 further including a valve for selectively opening and closing the lower flow path, whereby when the one way valve is closed, the catchment chamber can be drained of cleaning liquid separately from the washing chamber.

6. A washing apparatus according to claim 5 wherein the valve is a one way valve to prevent a back flow of cleaning liquid from the washing chamber to the catchment chamber.

7. A washing apparatus according to claim 2 wherein the first air inlet includes a plate provided with a plurality of through holes, the plate overlying and spaced above a bottom wall of the washing chamber to form, with the bottom wall, a manifold chamber into which air is delivered for bubbling through the washing chamber.

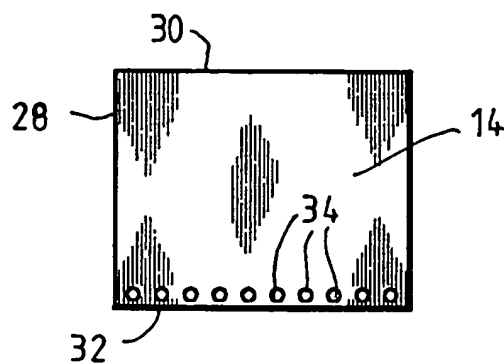
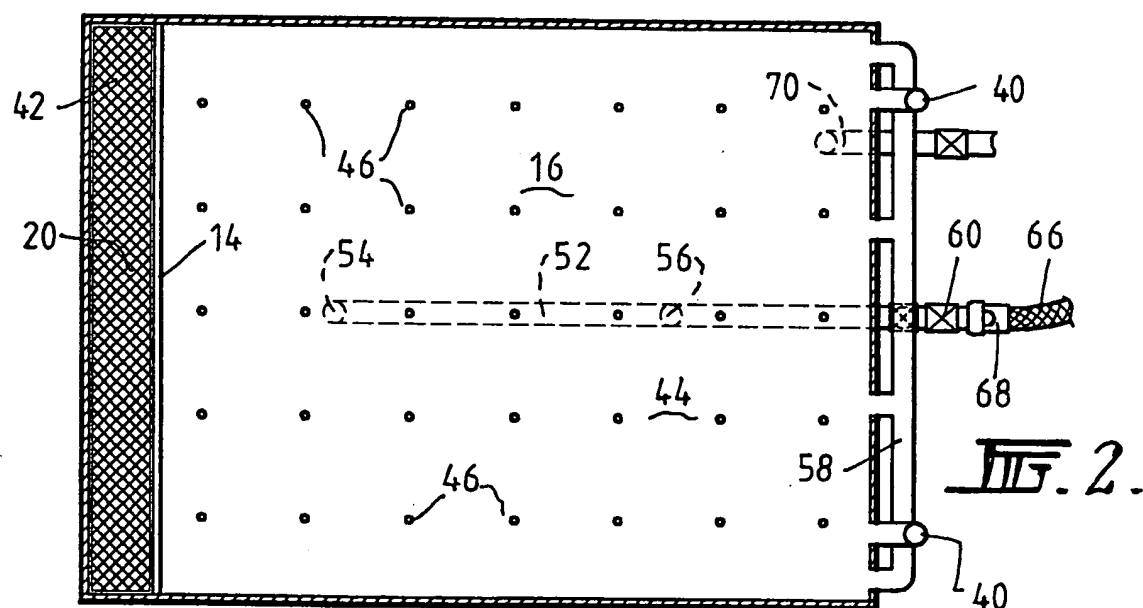
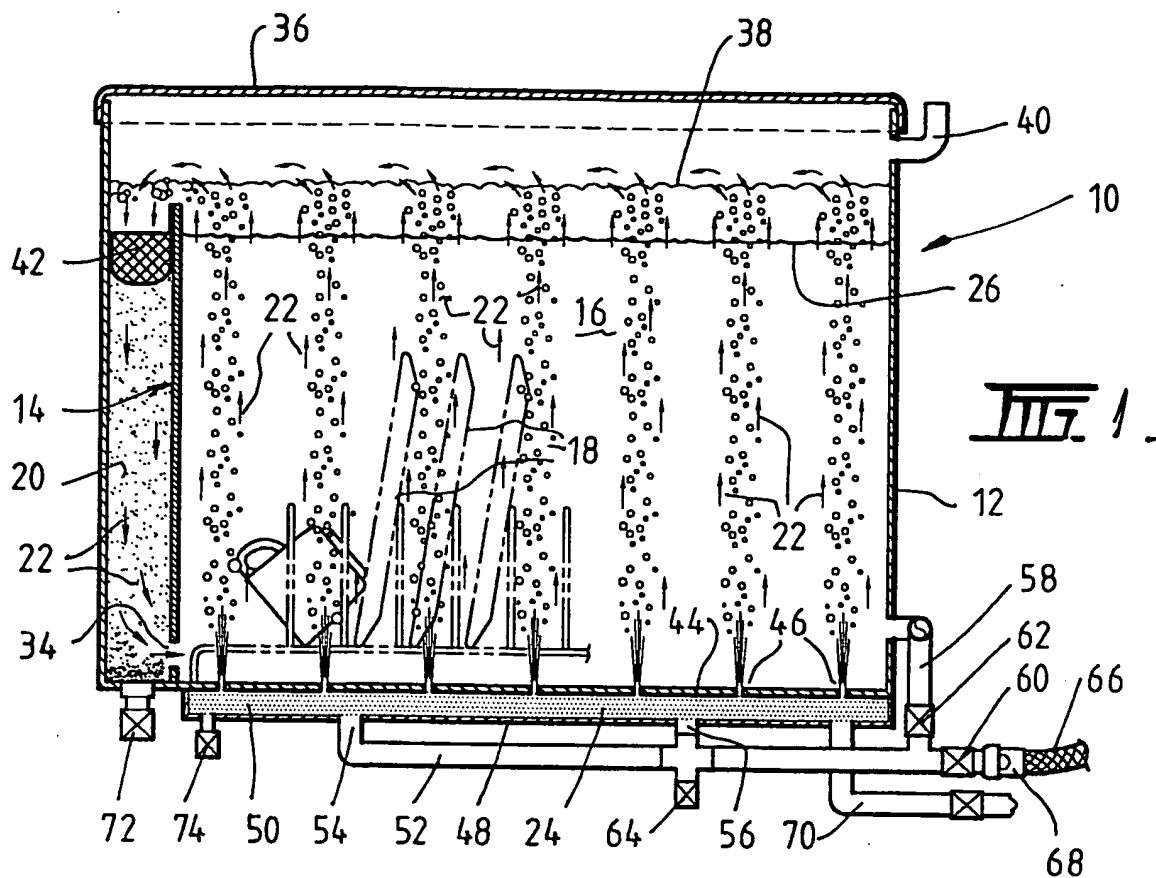
8. A washing apparatus according to claim 7 wherein the catchment chamber returns cleaning liquid to the washing chamber at a location above the plate. Preferably the bottom of the catchment chamber is sunk to a position below the lower flow path to provide a relatively static pool of cleaning liquid in which the dirt and foreign matter can settle.

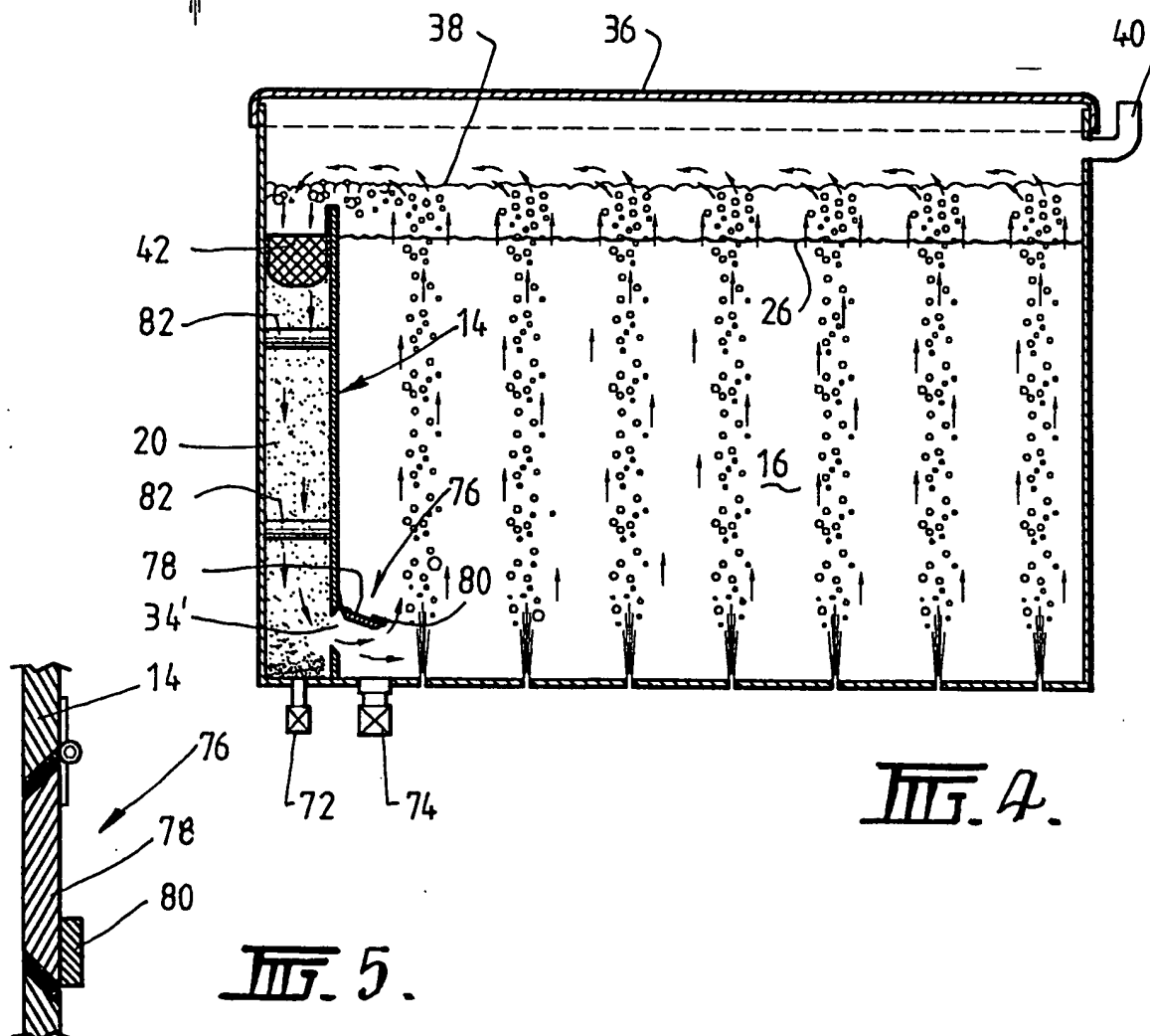
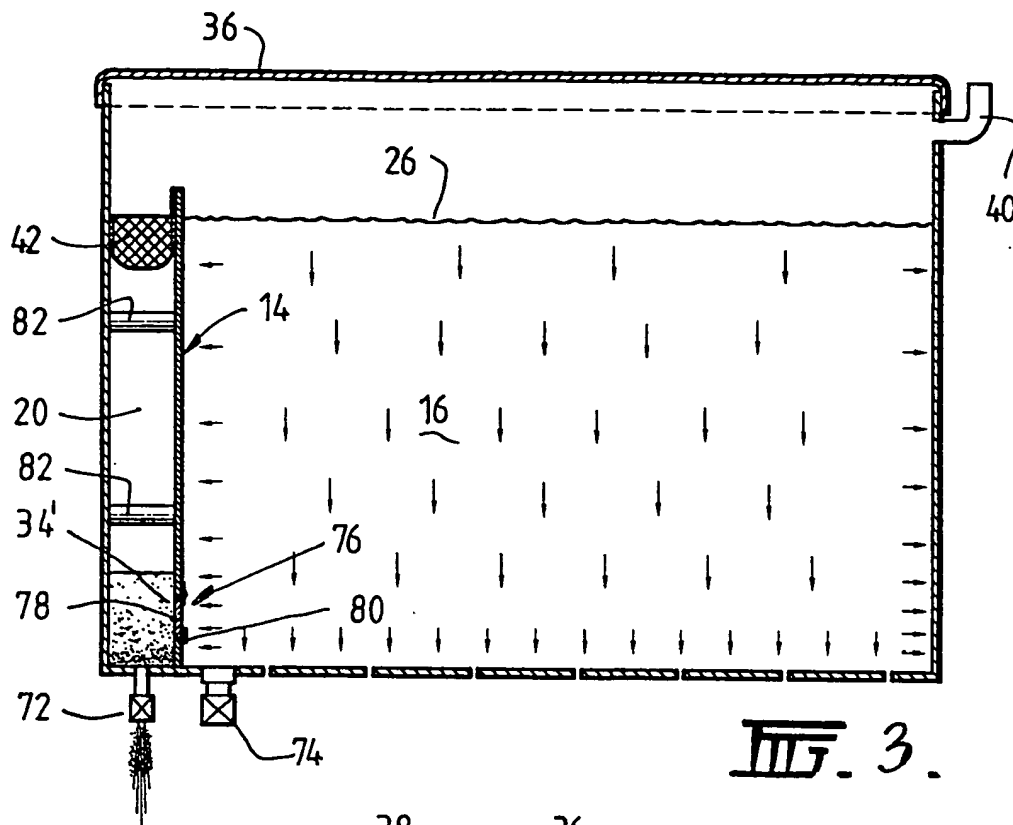
9. A washing apparatus according to claim 3 wherein the lower flow path returns cleaning fluid to a location below the plate.

10. A washing apparatus according to claim 4 wherein the lower flow path returns cleaning fluid to a location below the plate.

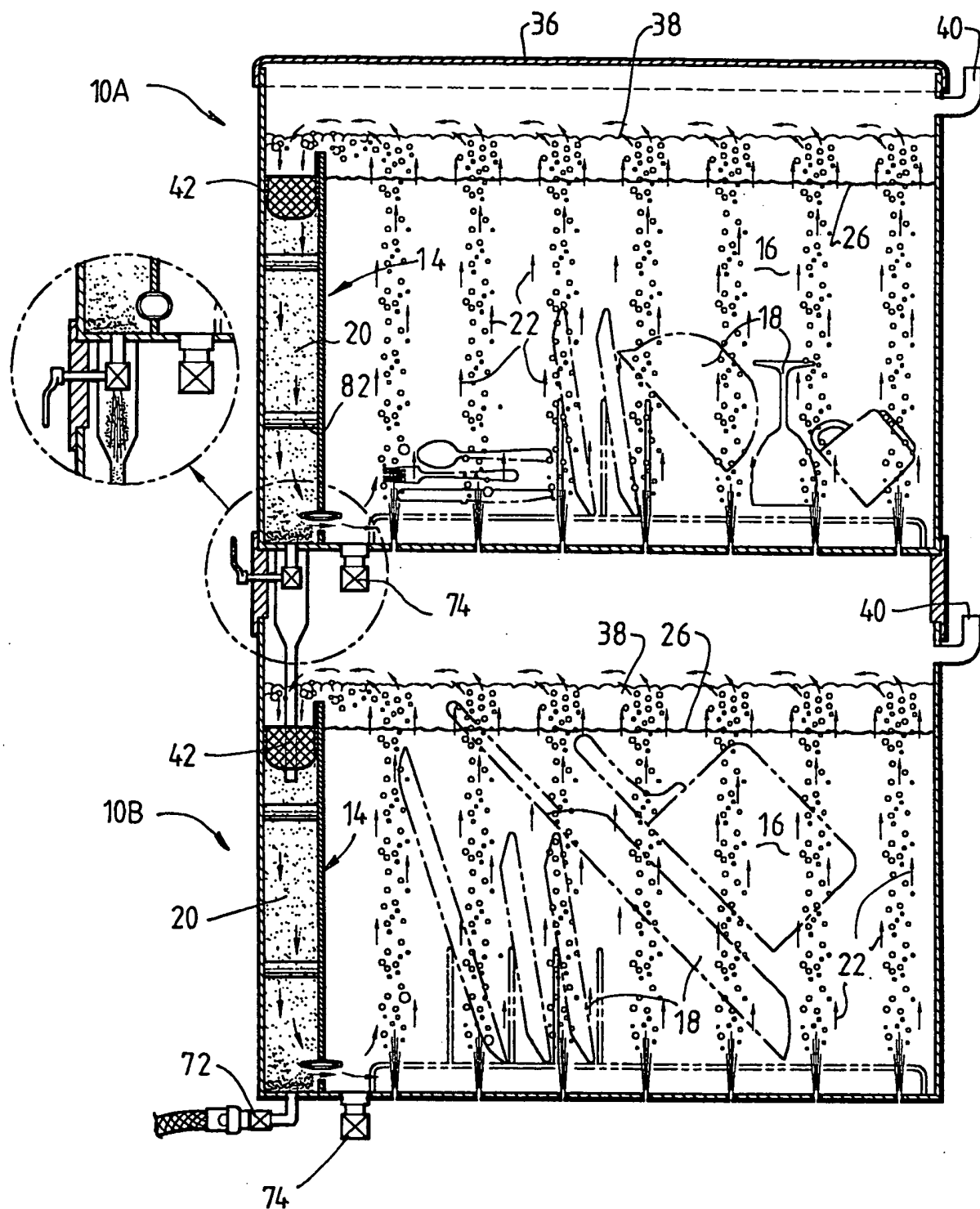
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11. A washing apparatus according to claim 7 wherein the manifold chamber is adapted to receive a cleaning liquid supply line to allow the filing of the vessel with cleaning liquid via the manifold chamber and the holes in the plate.
- 5 12. A washing apparatus according to claim 1 wherein each of the washing chamber and catchment chamber is provided with a separate drain to allow independent draining of the washing chamber and catchment chamber.
- 10 13. A washing apparatus according to claim 11 wherein air and cleaning liquid can be simultaneously delivered to the manifold chamber to provide a mist or spray of cleaning liquid for rinsing articles deposited in the washing chamber.
14. A washing apparatus according to claim 1 further including a second air inlet for directing air onto articles held within the washing chamber when the washing chamber is drained of cleaning liquid to facilitate drying of the articles.

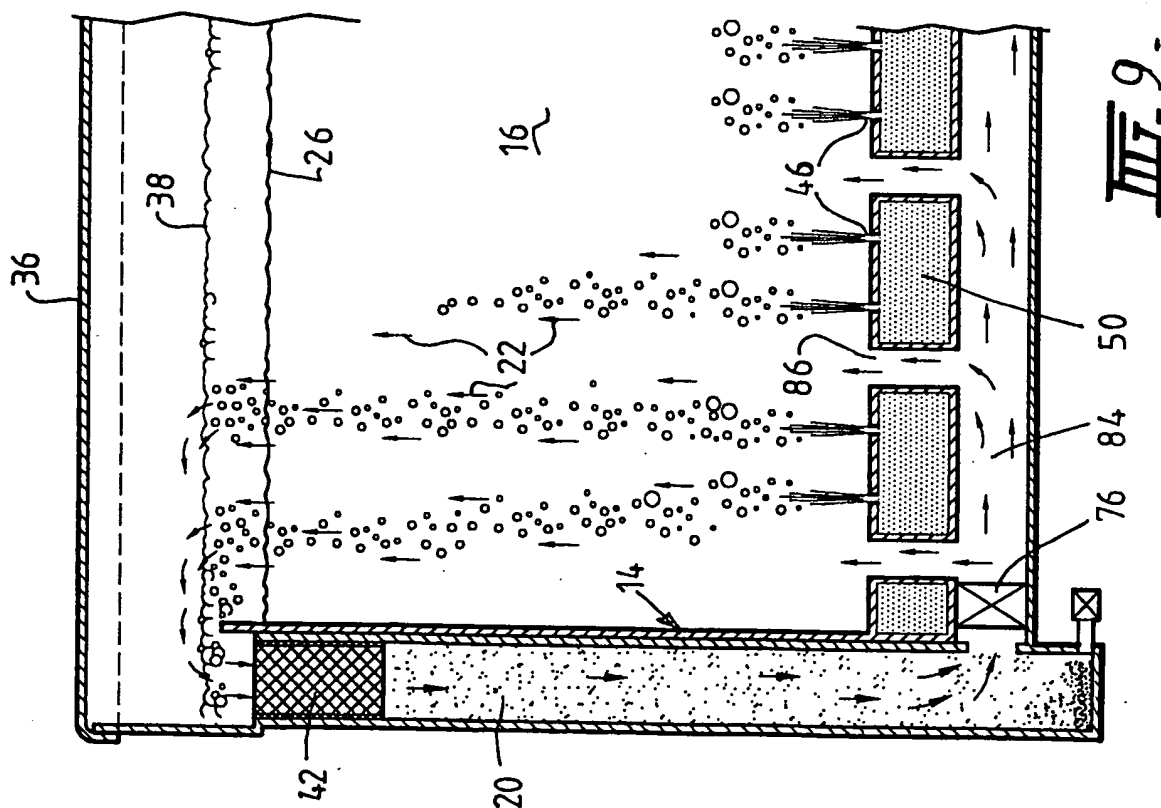
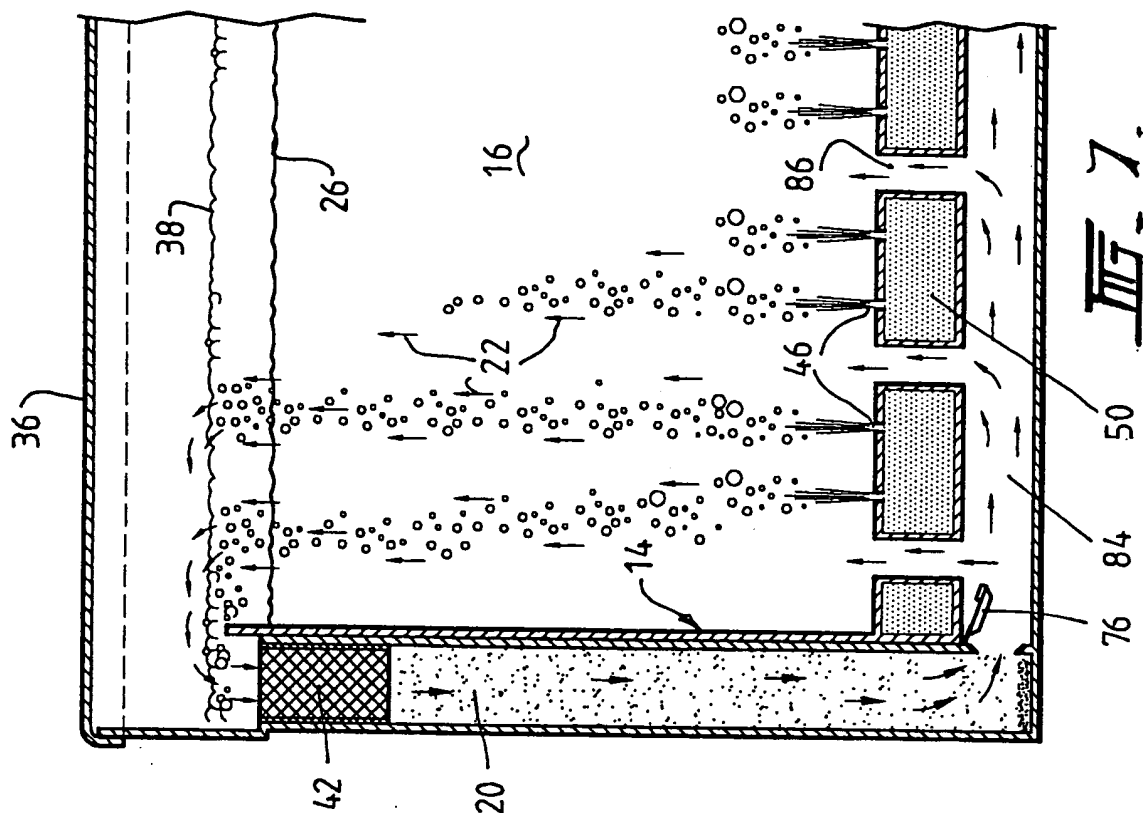




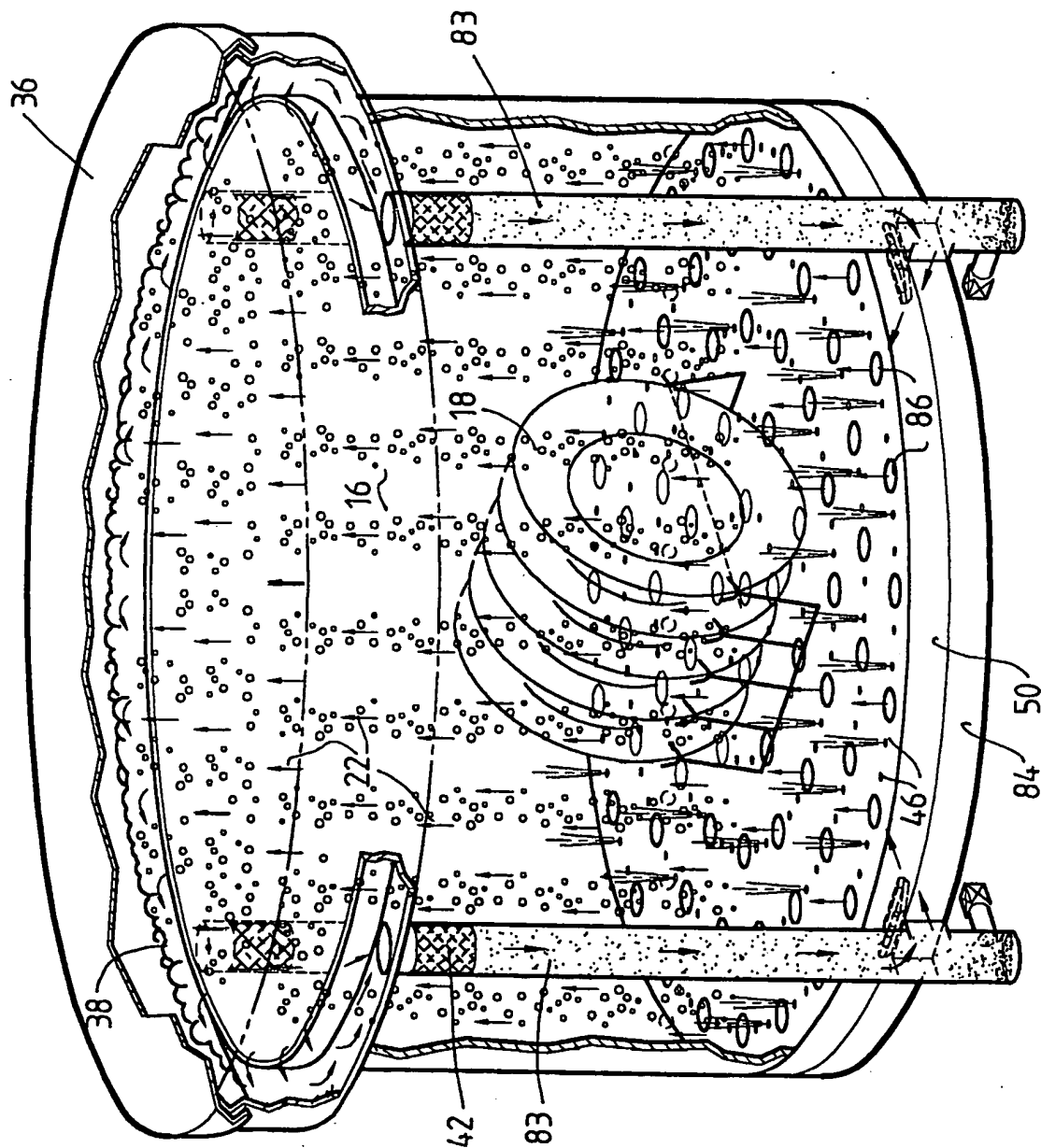
**FIG. 5.**



III. 6.



III-8.



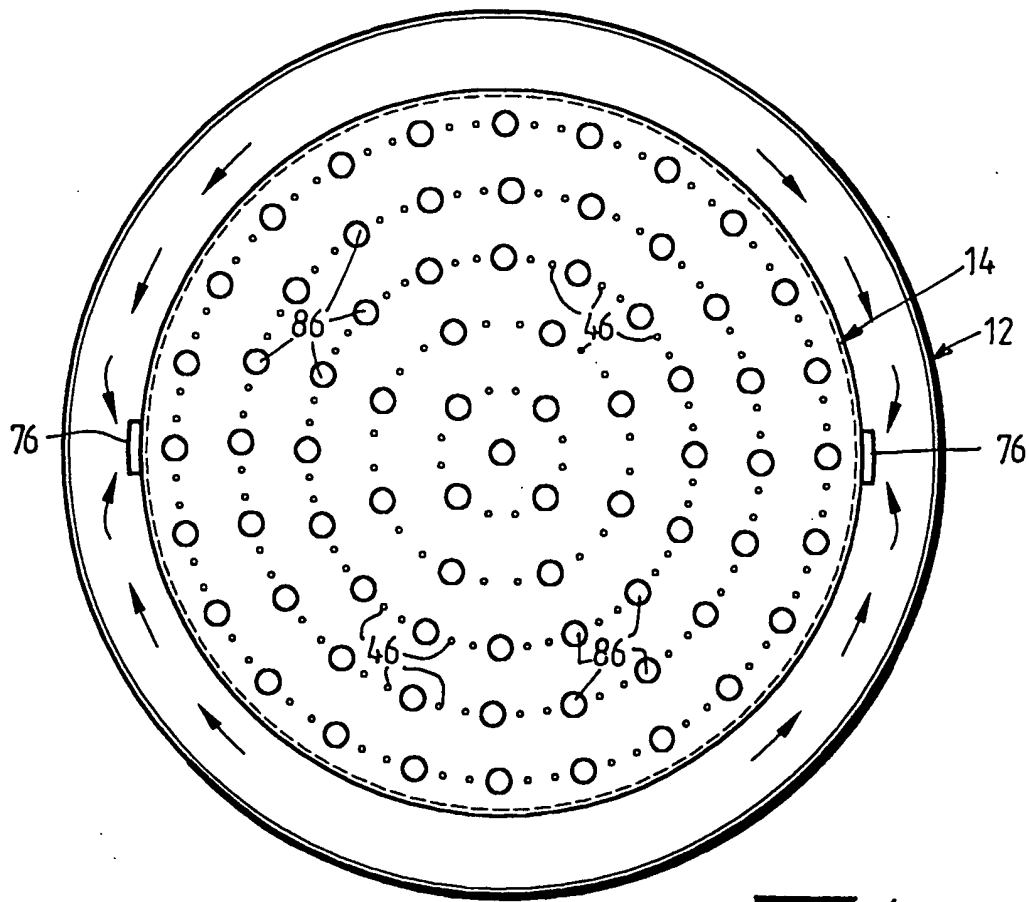


FIG. 10.

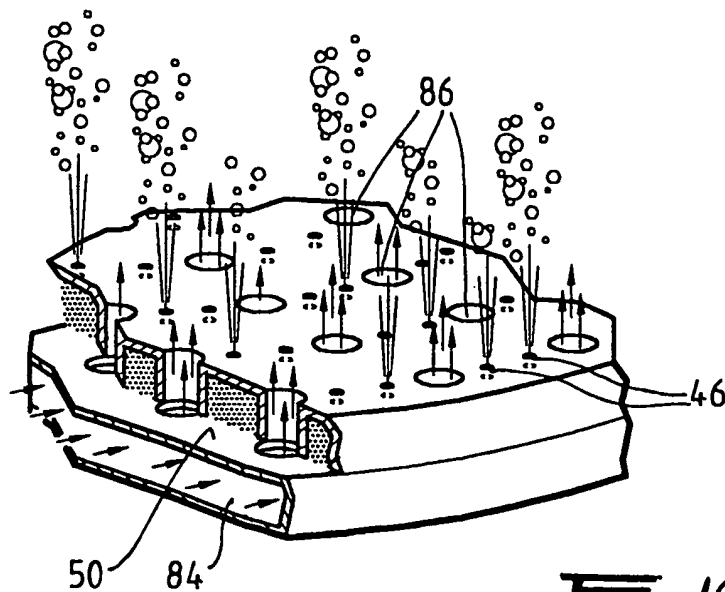
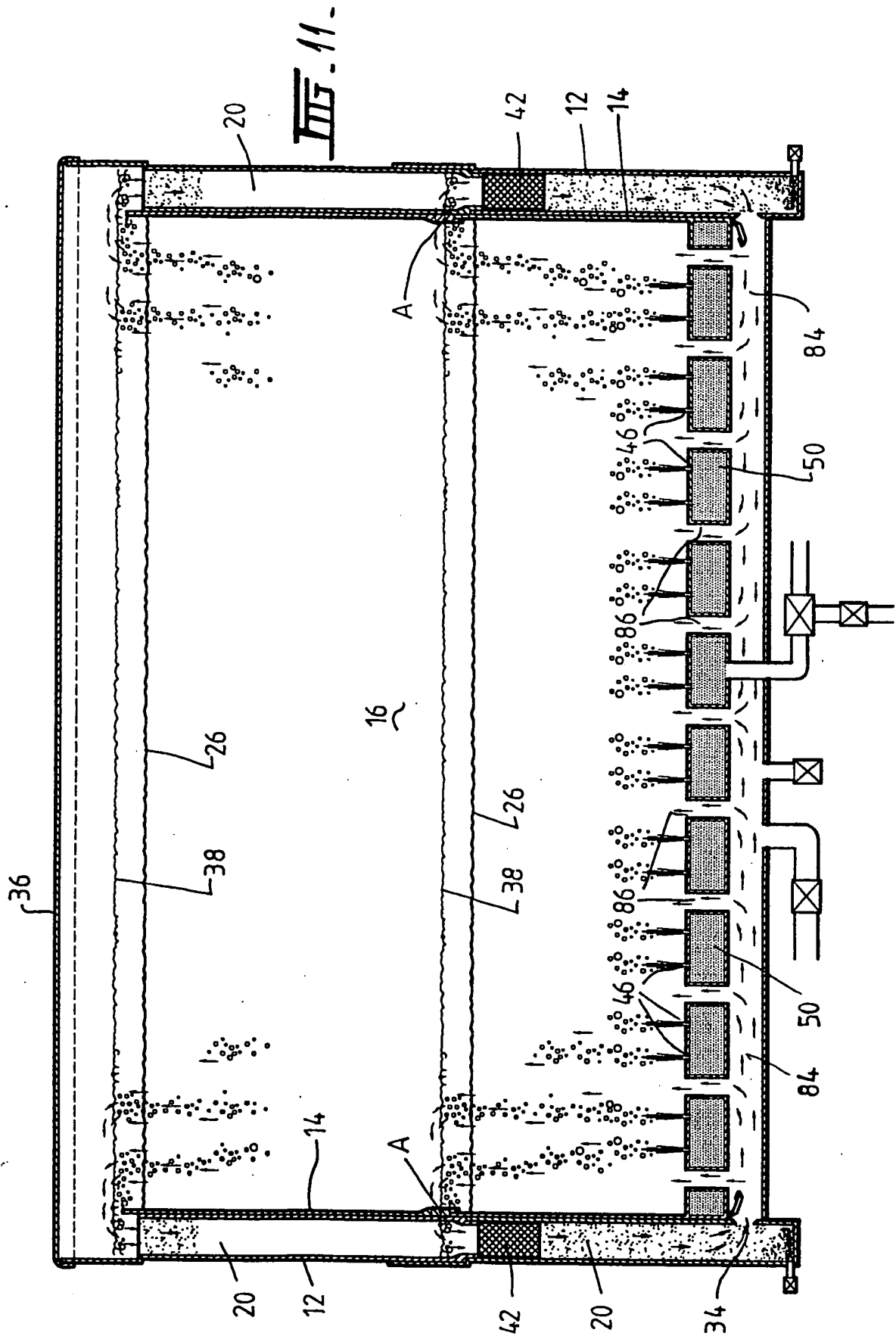


FIG. 12.





## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/AU 99/00113

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int Cl <sup>6</sup> : A47L 15/10, D06F 17/12		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) IPC: A47L 15/10, B06F 17/12		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPAT		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 739005 A (DUVIEUSART) 4 January 1933	
A	Derwent Abstract Accession No 92-356018-43, Class X27 SU 1694742 A (GLAYSHEV) 30 November 1991	
A	Derwent Abstract Accession No 97-455908/42, Class F07, RU 2075564 A (UNIV UFA AVIAT TECHN) 20 March 1997	
A	Derwent Abstracts Accession No 94-353817/44, Class X27 JP 6-277384 A (IKEGUCHI) 4 October 1994	
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input type="checkbox"/> See patent family annex		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search 17 March 1999		Date of mailing of the international search report 31 MAR 1999
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929		Authorized officer  SUSAN T. PRING Telephone No.: (02) 6283 2203